NORGES HANDELSHØYSKOLE

Bergen, 2007/06/20

Media Exposure and Underpricing

IPO underpricing and media coverage in the time prior to and after going public

Johan Ailo Mattias Kalstad

Supervisor: Dr. Carsten Bienz

MSc Thesis, Major in Financial Economics

NORGES HANDELSHØYSKOLE

Abstract

I examine the relationship between IPO underpricing and media exposure, using a sample of 54 IPOs launched on the Oslo Stock Exchange in the period of 2003-2006. I use the *A-tekst* database to measure media exposure, using four observation periods relative to the IPO. The findings show that there is a negative relationship between underpricing and media coverage in the IPO subscription period. Furthermore, I show that underpricing increases publicity in the time after the listing. However, the study fails to find any significant relationship between underpricing and media coverage in the week prior to going public.

Acknowledgment

I would like to express my gratitude towards those who have contributed to make this work more than just a final mandatory stage of my masters degree.

In this manner, Kristine Hesjedal deserves special mention, as we have collaborated on the data collection. She has also been my discussion partner, giving me valuable and inspiring inputs through the entire work. Furthermore, I thank my supervisor, Dr. Carsten Bienz whose insights, recommendations and encouragement are highly appreciated.

Anders Håkonsen and Vivienne Knowles are furthermore, much appreciated for their thorough and critical proof reading.

Contents

1. Introduction

Media and financial markets are closely interconnected. The financial news provides updates on relevant events that may affect market movements. On the other hand, market players contribute to the media image by disclosing and revealing information and giving their analyses, opinions and recommendations. Media is an arena where market actors can coordinate their views and distribute information.

This thesis looks at the role of media exposure when firms go public, and how this relates to the usual discount that is given in connection with an Initial Public Offering (IPO), referred to as underpricing. An IPO is defined here as the act of raising capital in connection with becoming a listed company on a public stock exchange.

On average, shares sold through an IPO experience an abnormal first day return on the public stock exchange. This is regarded as a significant opportunity cost for the issuing firm, since this could have been avoided by more conservative pricing. The phenomenon of underpricing is well documented worldwide (Ritter, 2003). Various theories have searched to explain why firms leave money on the table. Rock (1986), one of the most quoted in this respect, explains underpricing as a means of reducing the adverse selection problem among investors. In his model, informed investors have superior information that they can take advantage of by only subscribing to offerings that are sold below their mean value. The uninformed investor, on the other hand, is not able to distinguish between an overpriced (which the informed investor would avoid) and an underpriced offering. She will therefore fear a winner's curse. In order to assure a sufficient demand, Rock (1986) argues that the offering must gain the uninformed investor's trust by giving a discount.

Among other theories which build on asymmetric information we may also find that underpricing is explained as a reward to informed investors for revealing their information (Benveniste and Spindt, 1989), as an act to signal the firm's quality (e.g. Welch, 1989) and as a result of conflicting interests between the issuer and its underwriters (e.g. Loughran and Ritter, 2002).

As one can understand, information plays a major role in understanding the concept of underpricing. One should therefore assume that effective communication would be crucial to the issuer and its intermediates in order to reduce the asymmetric information problem. In this manner, promotion through the media is stressed in the literature describing the IPO process. Jenkinson and Ljungqvist write that, *"Other important forms of marketing can include press briefings, which can be especially important when the involvement of retail investors is desired (…)"* (2001:15).

From this quote, we may understand that media exposure is effective in the sense of having a wide range. Media enables communication to a broad range of investors in order to make them aware of the offering and to educate uninformed investors. A distinction is usually drawn between retail and institutional investors, where the latter group is normally regarded as informed. In the early marketing process, the issuer and its underwriters mainly communicate face-to-face with institutional investors in road shows. Retail investors however, are not included at this stage, and to reach out to them, one would therefore need broader promotion, as the quote reflects.

However, it would be a serious mistake to assume that the media is a one-way marketing tool where the issuer has a monopoly on information. This is far from true. In the media, we may also observe analysts and similar experts evaluating the offer on various grounds and potential investors giving their opinions and revealing complimentary information in order to have an impact on the market. The media therefore contains public, private and even noisy information.

Prior studies on media exposure and underpricing have reported that increased media attention is significantly related to the initial return. Liu, Sherman and Zhang (2006) report that media exposure is followed by increased underpricing, which they suggest is due to institutional investors stimulating the aftermarket in order to secure a quick return. According to their proposal, investors expect to gain this return as a reward for revealing their private information in the bookbuilding process.

DuCharme and Rajgopal (2001), however, argue that the excessive underpricing, which was experienced during the internet bubble in the late 90s and beginning of the new millennium, could be explained by media hype which seduced investors in the aftermarket.

A third approach, on the other hand, looks at how underpricing induces media awareness. Demers and Lewellen (2003) argue that part of the IPO discount is motivated by increased publicity and marketing benefits. This is based on the observation that increased underpricing is followed by publicity in the media. They therefore suggest that part of underpricing should be regarded as a deliberate strategy to raise awareness of the company and its products or services.

In this thesis, I examine whether ex ante media exposure is related to underpricing, and the other way around - if underpricing affects publicity ex post. I search to investigate three main questions: *1) Does media coverage in the immediate time prior to going public affect the demand in the aftermarket, and thereby induce an extensive return*, *2) Does media coverage in the subscription period reflect the information gap and thereby the IPO pricing,* and *3) Is underpricing related to publicity after becoming listed*. I explain these questions in more detail in the methodology chapter.

Endeavours to answer these questions are based on a quantitative empirical study built on a sample of 54 IPOs on the Oslo Stock Exchange from 2003 to 2006. In order to measure media exposure I make use of the *A-tekst* database maintained by Norway's largest and most significant newspapers. Furthermore, I use different observation periods relative to the IPO, in order to answer the proposed questions.

The structure of the thesis is as follows. In section 2, I give a brief literature review of the theoretical literature that I find relevant to the scope. Furthermore, in section 3 the empirical design is developed. Section 4 describes the data sample, before presenting descriptive data in section 5. Thereafter follows a multiple regression analysis and discussion of results (section 6), before the presentation is closed with a discussion on the robustness of the findings (section 7) and a conclusion (section 8).

2. Literature review

Since Ibbotson and Jaffe (1975) documented the phenomenon of underpricing, it has been one of the greatest puzzles in the literature of finance. No single theory is, however, yet able to give an exhaustive explanation, whereby many various approaches contribute to explain frequent complimentary areas. The theoretical approaches therefore range widely with the major approaches concentrating on asymmetric information, institutional concerns and ownership control as the suggested explanations (Jenkinson and Ljungqvist, 2001). On the other hand, this review focuses on theories that are relevant to the relationship between media coverage and underpricing. It is therefore far from exhaustive.

2.1 Theories on underpricing

Since media obviously contain information, asymmetric information theories are central to the following analysis. Asymmetric information theories build on the assumption that some players are better informed than others are. Investors or issuers have private information, not publicly known, which creates uncertainty in the market.

Winner's curse

Rock's (1986), winner's curse model is one of the earliest models that formally and rationally explains underpricing. An important feature of this model, and how it differs from competing models, is that it assumes that the issuer is not able to discriminate between uninformed and informed investors. Shares are thereby, allocated randomly among investors. By a winner's curse, we therefore mean the uninformed investors' fear of being allocated a relatively larger portion of overpriced offerings (because the informed will not subscribe to them) than of underpriced ones (because they will then have to compete with the informed investors in the allocation). Without underpricing, the uninformed investors would, on average, experience a negative return.

Therefore, to assure that the offering is successfully completed, shares are sold significantly below their real value to attract the marginal uninformed investor. According to Rock (1986), underpricing should be regarded as a rational action taken by the issuers to reduce the issuer's risk of having to withdraw the offering.

Information revelation theory

Benveniste and Spindt (1989), on the other hand, assume that the issuer is able to identify and favour informed investors, whereby the marginal investor is assumed to be informed. In this light, they argue that underpricing should be regarded as a reward to investors for revealing their private information. Informed investors are assumed to have superior information relative to the issuers, and issuers use underpricing as a means to induce it.

An important feature of this model is that it takes a bookbuilding approach. When using such an IPO method, one will typically set an indicative price range before deciding on a final subscription price. In the bookbuilding period, investors are asked to sign their unbinding interest to the offering. This is intended to give the issuer an estimate of the expected demand when the final offering price is set and the offering is carried out. Rock (1986), on the other hand, builds his model on fixed price offerings. When such a method is used, the prospectus will contain a single offer price, which is regarded as a take-it-or-leave-it proposal (Jenkinson and Ljungqvist, 2001).

According to Benveniste and Spindt (1989), investors would have an incentive to reveal their correct interest if they are rewarded with underpricing combined with being allocated a larger share of the offering. Issuers should therefore design the process so that investors that show an interest in the upper half of the indicative price range are rewarded with a larger portion of the offered shares.

Partial adjustment

Benveniste and Spindt's (1989) model assumes that the offering price is only partially adjusted to the new information about increased demand. Hanley (1993) tested this assumption empirically, and showed that when offering prices were revised upwards relative to their indicated levels, underpricing tended to increase significantly. However, there are

several views other than Benveniste and Spindt's (1989) model that attempt to explain the phenomenon of partial adjustment.

Prospect theory

Developing one of these views, Loughran and Ritter (2002), argue that partial adjustment can be predicted by public information. They argue that underwriters take advantage of underpricing in self-interest by rewarding their most favored investors. This is in contradiction with Benveniste and Spindt's (1989) proposal, which says that underpricing is driven by the revelation of private information. The puzzle is therefore to answer why issuers accept that underwriters leave money on the table in their own interests, in spite of the publicly available information. To answer this, they make use of Kahneman and Tversky's (1979) prospect theory. They argue that issuers are more excited about the relative increase in their wealth, experienced by an upwards price revision, than being upset about underpricing.

Substitute theory

Ljungqvist and Habib (2001), on the other hand, argue that underpricing is used as a substitute for marketing expenditures. Because promotion reduces the adverse selection problem, it should also reduce underpricing. Issuers therefore face a trade-off between underpricing and marketing expenditures. Their article empirically shows that every dollar spent on promotional activities, such as road shows, prospectus, underwriter reputation, auditing etc. decreases underpricing by one dollar on the margin.

Sentiment investor theory

Recently however, there has been a growing concern that the financial markets do not necessarily act rationally all the time. This concern is also present in the literature on underpricing where sentiment investor theories in particular, frequently explain how irrationality may affect underpricing.

Sentiment investor theories assume that some investors have biased estimates of a company's value, based on noisy information in the market. Ljungqvist, Nanda and Singh (2003) developed a model that distinguishes unbiased and sentiment (biased) investors. Sentiment investors can be either too optimistic or too pessimistic regarding company valuation. However, because short trading is not possible in the pre-market, pessimistic investors do not participate.

This theory does not assume asymmetric information. Instead, the rational and irrational investors agree to disagree on their estimates. Institutional investors are assumed to have unbiased estimates. Underpricing is explained in that issuers sell IPO shares to informed investors, who gain positive returns by selling to retail investors with biased estimates in the longer-term aftermarket.. However, because demand could possibly decrease in the future, issuers have to compensate this risk by underpricing the shares.

2.2 Underpricing and media exposure

The studies focusing on the particular field of media and underpricing build on asymmetric theories, behavioural (sentiment) theories and marketing benefits to explain how media and underpricing are related. The main proposals from the literature may be summarized as follows:

- Media coverage in the subscription period reflects information that is used in pricing the offering and connected to the adverse selection problem.
- Media hype prior to going public fuels the demand in the aftermarket.
- Underpricing is deliberately used to increase ex post publicity as a substitute for product marketing expenditures.

2.2.1 Adverse selection and media exposure

Liu, Sherman and Zhang (2006) find an asymmetrical positive relationship between underpricing and ex ante media exposure. They suggest that underpricing is increased by positive news, as informed investors use the media to publish positive information.

According to their proposal, informed investors have no reason to withhold their private information from the public after revealing it to the underwriters. Rather, they have an incentive to create a sufficient demand in the aftermarket, in case they want to secure a quick return.

They interpret their empirical findings as evidence to Benveniste and Spindt's (1989) model, which says that investors are rewarded for revealing positive private information. However, one should be aware that their definition of positive and negative news does not say anything about the news content. Positive news is defined as media exposure on offerings that make an upward price revision, regardless of what the news actually reports. Likewise, negative news is defined as equal to the media exposure on offerings that make a downward price revision. A strict interpretation of their findings would therefore suggest there is a positive relationship between underpricing and media coverage only for offerings that make an upward price revision.

2.2.2 Media hype and underpricing

As argued, media coverage also contains noisy information, which may have an irrational impact on market movements. In particular, the media is accused of fuelling irrational optimism among investors in bull markets, by giving disproportional attention to certain stocks. Clark, Thrift and Tickell (2004) argue that the media drives stock prices upwards in good times, while it acts more as a bystander in bad times.

The period of the so-called dotcom bubble in the late 90s and the beginning of the new millennium is often characterized as a time of extreme optimism, which some claim was partly fuelled by media hype. DuCharme and Rajgopal (2001) show that extensive media exposure in the week prior to going public is significantly related to the initial return. They, furthermore, argue that high growth companies in the so-called "new economy" made use of such hype to boost the demand in the aftermarket in order to increase underpricing. In this way, they attempted to leave a good taste in the mouths of pre-market investors, and as a result, received favourable terms when quickly returning to the capital markets. This argument is based on companies with a high cash burn being particularly underpriced, which gives sense to why issuers accepted leaving money on the table.

However, a later study on a sample from the London Stock Exchange conducted by Staikouras and Tsatsanis (2004) reports that the final week's media coverage is negatively related to underpricing. The comparative advantage of their study is that it consists of companies from a wide range of industries, and over a longer period. They argue that a negative relationship could imply a shift in investor psychology, since a negative relationship reflects that investors are well informed on companies surrounded by high media coverage. However, they also suggest an alternative explanation which is built on behavioural arguments, which I will not go further into depth.

2.2.3 Underpricing, media exposure and marketing benefits

It has also been argued that underpricing could be used as a means of gaining marketing benefits. The interplay between product markets and financial markets has been subject to growing interest in recent years (Demers and Lewellen, 2003). So has the relationship between IPOs and marketing benefits, and how underpricing impacts on this. The marketing benefits are used as a complementary argument as to why issuers would tolerate an extensive underpricing, in particular during the Internet bubble (Demers and Lewellen, 2003).

Demers and Lewellen (2003) investigate a sample of Internet firms, where they show that underpricing is positively related to ex post Internet traffic. They furthermore show that the money left on the table as underpricing is below of the marginal cost of increased web traffic.

In addition, they examine a larger sample of both Internet and non-Internet IPOs, showing that the marketing benefits associated with underpricing goes beyond web traffic. They use media exposure as an indirect proxy for marketing benefits, arguing that the effects on direct product market performance are too difficult to measure. In this study, they show that underpricing is positively related to publicity.

Schaller (2004) also shows a significant, positive relationship in the subsequent month to the listing. She examines a sample of 76 Swiss IPOs comprising both Internet and non-Internet companies over a long period. However, she fails to find a significant relationship between underpricing and media coverage in the second month after going public.

3. Methodology

From the literature review, we may see that previous studies have documented significant relationships between media exposure and underpricing. In this section, I make use of these observations to construct an empirical design in order to answer the questions raised in the introduction.

As a starting point, it is worth notice that the literature implicitly distinguishes between ex ante and ex post media exposure. This distinction is important in terms of the direction of causality. While ex ante media exposure is assumed to cause underpricing, ex post media exposure is expected to be affected by underpricing. The empirical design of this study is therefore built on this distinction.

3.1 Hypotheses

According to the described literature on media exposure and underpricing, there are at least three reasonable hypotheses. The first and the second describe the relationship between ex ante media exposure and underpricing, while the third covers the impact of underpricing on ex post publicity.

Hypothesis 1 finds legitimacy in DuCharme and Rajgopal's (2001) article.

> ***Hypothesis 1:*** *Media exposure in the week prior to the listing is related to underpricing through its influence on the aftermarket demand.*

Hypothesis 2 on the other hand, is in accordance with Liu, Sherman and Zhang's (2006) article.

> ***Hypothesis 2a:*** *Media exposure in the subscription period reflects information that is related to the pricing of the offering, and is thereby related to underpricing.*

Furthermore, Liu, Sherman and Zhang (2006) argue that this relationship is asymmetric. Media exposure only affects underpricing when the offering price is set above the midpoint

in the initial price range. However, when there is a downwards price adjustment, the article reports of no significant results.

> ***Hypothesis 2b:*** *Media exposure is asymmetrically related to underpricing depending on whether the offering price is adjusted upwards or downwards relative to the midpoint of the initial price range.*

When it comes to the time after the listing, the expected cause and effect relationship is reversed. The third and final hypothesis is in accordance with Demers and Lewellen's (2003) article, which proposes that underpricing creates publicity.

> **Hypothesis 3:** *Underpricing creates media coverage, and thereby there is a relationship between underpricing and ex post media exposure.*

3.2 Construction of variables

To measure underpricing (or overpricing), the initial first day return is defined as

$$Initret = \frac{P_1 - P_0}{P_0}$$

P_0 is the final subscription price (IPO price), while P_1 is the closing price on the first day of trading on the OSE. The final offering prices are collected from the listing prospectus published by the companies or from press releases published on OSE's homepage. Furthermore, the first day closing price is taken from OSE's homepage.

To measure media exposure, the number of hits when searching the company names together with the word '*børs*' (Norwegian for '*stock exchange*') in the database *A-tekst* is used.

Because news regarding the listing is most relevant to the scope of this study, the word '*børs*' is included in the search criteria. In this way, most of the news regarding other (irrelevant) events is excluded. I find this necessary due to the broad range of media sources included in the *A-tekst* database. When excluding this word, numerous, irrelevant news articles appear, which make no sense regarding the IPO. Furthermore, hits only containing

general daily market updates (such as share price tables etc.) are not taken into account. Only news articles are included.

The observation periods are set according to the three developed hypotheses. To test *hypothesis 1*, the observation period is set to begin one week prior to the listing, and ends one day before the listing. The construction of this media variable is in accordance with DuCharme and Rajgopal's (2001) article. The underlying idea is to test how media exposure impacts on the demand in the aftermarket. This construction would be reasonable since the IPO subscription period normally ends one week prior to the listing (on average 6.5 days in this sample). One would expect that media exposure in this week does not affect the IPO pricing.

For the *second hypothesis*, the media observation period is identical to the subscription period. This construction is in accordance with Liu, Sherman and Zhang's (2006) methodology. The underlying idea is to capture media articles revealing information on the final pricing.

For *hypothesis 2b*, two additional media variables are constructed. These are supposed to capture any asymmetric relationship depending on whether there is a downwards or upwards price revision from the midpoint of the initial price range. This is also in accordance with Liu, Sherman and Zhang (2006):

- *'PositiveNews'* equals media hits in the subscription period, if the offering price is set above the midpoint in the initial price range. If otherwise, the variable is equal to zero.
- *'NegativeNews'* equals the number of media hits in the subscription period, if the offering price is set below the midpoint of the initial price range. If otherwise, the variable is equal to zero.

Furthermore, to test *hypothesis 3*, I use ex post media hits, in accordance with Demers and Lewellen's (2003) paper. First, I count media hits in the month after the listing. The observation period starts on the day of the listing, and ends one month minus one day after the listing. Thereafter, a variable for media hits in the second month ex post (starting one month after the listing and ending two months minus one day after the listing) is constructed. This is to investigate the persistence of the media coverage.

3.3 Construction of control variables

Although the main scope is to investigate the relationship between underpricing and media exposure, the study still recognizes other causes to underpricing and media exposure. An empirical model should include variables that are expected to have a causal effect to the explained variable (Keller and Warrack, 2003). The construction of control variables, including the argumentation for the use of them, is explained in this section.

3.3.1 Underpricing control variables

The designed models used to test *hypothesis 1* and *2* include controlling variables, which find legitimacy in the literature of underpricing.

Control variables for testing ex ante media exposure on underpricing:

- the oversubscription ratio (*'OvrSub'*)
- relative price revision (*'PrRev'*)
- dummy variable for bookbuilding methods (*'Book'*)
- Hot market dummy *('Hot')*
- underwriter's market share ('*MShare*')
- dummy variable for venture capital backing (*'venture'*)
- the natural logarithm for company age ('lnAge')

Oversubscription ratio

The oversubscription ratio is a proxy on the demand for the offered shares. Chowdhry and Sherman (1996) argue that the oversubscription ratio reflects that offering price is set too low in order to assure a demand for the offered shares. They suggest that information about the discount is leaked to the market, inducing oversubscription.

Relative price adjustment

Partial adjustment is controlled by the percentage price revision from the midpoint of the bookbuilding price range, relative to the size of the interval[1]. The underlying idea is that a positive price revision will only be partially adjusted to the demand learned through the bookbuilding process. Thereby one would expect a positive relationship between the relative price revision and the initial return. The method is in accordance with Hanley's (1993) article.

Bookbuilding

Even though bookbuilding now seems to be the most frequently used IPO method in most of the world (Ljungqvist, Jenkinson and Wilhelm, 2003), we still find some IPOs using fixed pricing methods in this sample (9 out of 53 offerings). Bookbuilding is often assumed to lead to more accurate pricing, since it enables underwriters to estimate the demand in the pre-market. Ljungqvist, Jenkinson and Wilhelm (2003) test this assumption empirically, and find this to be true, at least for IPOs lead by US investment banks. In this study, a dummy variable, which is equal to one if bookbuilding is used, and zero for fixed price offerings test the effect of the choice of IPO method.

Hot market

Among the earliest observations in the literature of underpricing is that IPO activity is cyclical. Ibbotson and Jaffe (1975) introduced the term 'hot market' which they define as *'periods which the average first month performance (or aftermarket performance) of new issues is abnormally high'* (Ibbotson and Jaffe, 1975:1027). Later literature has characterized hot markets as periods when there is an unusually high IPO volume, exceeding underpricing and, from time to time, high concentrations within particular industries (Helwegee and Liang, 2002).

In this study, a hot market is defined as a quarter of a year when the average underpricing exceeds the median quarterly average underpricing. After identifying hot periods, a dummy is constructed, which is equal to one if the observation lies within a period according to the developed definition. It should though, be mentioned that there exist alternative proxies for hot markets, where e.g. volume is frequently used (Loughran and Ritter, 2002).

[1] *Percentage price revision = (IPO price – Midpoint of the indicative price range)/ Midpoint of the indicative price range*

Underwriter's market share

According to Booth and Smith's (1986) model, underwriters use their reputation to certify that the issue is not overpriced. Thereby one may reduce the adverse selection problem and underpricing. However, studies of the late 90s (e.g. Beatty and Welch, 1996) reported that the sign of this relationship had changed to negative. Various researchers have contributed to explain this change. Some of these argue that issuers buy analyst coverage from reputable underwriters by allowing for underpricing, in order to gain attention in the aftermarket. Cliff and Jensen (2004) prove that increased underpricing follows lead underwriters with an all-star analyst among their associates.

The use of market share as a proxy for underwriter reputation is in accordance with the methodology developed by Megginson and Weiss' (1991). Market share is defined as the investment bank's relative share of the total gross proceedings in the sample. However, it is still worth noticing that there exist alternative methods to proxy underwriter reputation. Carter, Dark and Singh (1998) argue that an underwriter would be concerned about the firm with which it is associated. According to them, proceedings alone give an inaccurate picture of reputation. They therefore use various criteria to rank underwriters, in accordance with the Carter-Manaster tombstone method (Carter and Manaster, 1990).

Venture Capital

In addition, it is also suggested that venture capital participation acts as certification for the quality of the IPO. Venture capital funds, which bring firms to the market at high frequency, will have an incentive to maintain a good reputation in order to gain access to the capital markets on favourable terms and to attract entrepreneurs of new projects. Megginson and Weiss (1991) therefore argue that VC participation can be a credible signal to the financial markets, which would reduce the asymmetric information relation. They empirically show that IPOs backed by venture capital suffer less from underpricing than non-venture capital backed IPOs.

To include the expected effect of VC participation, a dummy is constructed, which is equal to one in the cases where venture capital funds are found among the company's investors, and zero otherwise.

Age

Megginson and Weiss (1991), furthermore, show that age is negatively related to information asymmetry. This implies that older firms suffer less from underpricing than younger firms.

This seems to be a reasonable expectation since older firms have a longer history of earnings, and often come from established industries. Younger firms, on the other hand, may lack a credible earning record and come from immature industries. Age is defined as the number of years between the corporation of the firm and the IPO.

3.3.2 Media exposure control variables

As with underpricing, other causes of media exposure are expected. These are relevant in designing a model for *hypotheses 3*.

Control variables expected to account for media exposure:

- The natural logarithm to gross proceedings (*'lnProceedings'*)
- A business-to-consumer dummy (*'B2C*')
- Underwriter market share (*'MarketShare'*)
- A venture capital dummy (*'Venture'*)
- A hot market dummy (*'HotMarket'*)

Gross proceeding

Gross proceeding is included on the assumption that large IPOs attract more public attention. Demers and Lewellen (2003) report a significant positive relation between proceedings and media coverage in the months subsequent to the IPO. The constructed variable includes the proceedings obtained from selling primary and secondary equity.

Business-to-Consumer relationship

The B2C dummy is equal to one if the company has a direct relationship to the end users of its product, otherwise zero. This is to control for the assumption that B2C companies gain

60more marketing benefits by going public. It is therefore assumed that they will put more effort into attracting publicity (Demers and Lewellen, 2003).

Underwriter market share

Furthermore, Demers and Lewellen (2003), argue that reputable underwriters are more closely followed by media, and therefore increase ex post media coverage. Megginson and Weiss (1991) argue that highly reputable underwriters are likely to select IPOs that attract media coverage.

Venture Capital

Demers and Lewellen (2003) also control for whether venture capital participation may attract increased media coverage. However, they fail to find any significant relationship here. The variable is still included, since reputable venture capital funds are likely to be followed by the press.

Hot market dummy

It would furthermore be reasonable to assume that media exposure is affected by the activity in the IPO markets. When firms go public frequently, one should assume that the media take interest in this activity. Alternatively, when firms seldom go public, it could be easier to catch the media's attention. A hot market dummy is constructed to capture these possibilities.

4. Data sample

The sample used in the analysis includes 54 IPOs launched on the Oslo Stock Exchange (OSE), in the period 2003-2006. The period is selected due to its relatively high number of IPOs. In this period, a total of 105 new listings were reported on the OSE. Furthermore, this period was chosen as a matter of practical concerns and time constraints. It was difficult to collect data from earlier periods, due to de-listings, mergers, de-mergers or bankruptcies.

51 listings are excluded from the sample. These listings have either made no public offering in connection to the listing, the companies are cross-listed (the company is already listed on another stock exchange) or it has simply been too difficult to find relevant data on the IPOs. Only primary listings, which announce public offerings in their listing prospectus, are included.

The company data is primarily hand collected from company web sites and the OSE's home page. However, since companies have various policies on which information they publish, it was also necessary to get some private information directly from the companies and from IPO underwriters. This is true in particular for the data on oversubscription ratios and gross proceedings.

All the data on media coverage is collected from the *A-tekst* database. This is maintained by Norway's largest and most significant newspapers and newswires[2]. The database is chosen for its significant coverage of Norwegian media, and accessibility. Having free access to the database's online services played a major role in this choice.

One should however, be aware that news from *Finansavisen* (Norway's second largest business newspaper, with a high focus on financial news), international media, Internet media or from broadcasting media is not included. These media are omitted due to time constraints and feasibility.

[2] *Aftenposten, Advokatbladet, Adresseavisen, avis1, Bergen Tidende, Dagbladet, Dagens Næringsliv, Dagsavisen, Klassekampen, Kommunal rapport, Nordlys, Økonomisk rapport, NTBtekst, Teknisk ukeblad* and *Hvem Hva Hvor*

5. Descriptive data

The average underpricing for this sample is 3.35 %, where NOK 798 million[3] was left on the table; an average of NOK 14.78 million per IPO. In total NOK 23.82 billion was raised through IPOs in the period; on average NOK 441 million per IPO.

The average initial return is approximately at same level as in Samuelsen and Tveter's thesis (2006), which studies the OSE IPOs in the period 2004-2005. However, it is somewhat lower than found in previous periods in Norway for example, Edvardsen (2005) reports the average underpricing in the period 1997-2004 to be 11.25 %. Furthermore, the average underpricing in this sample seems to be somewhat low compared to international studies (Ritter 2003). The relative underpricing could, however, be due to a small sample and short period.

Furthermore, we may observe that there is an annual variance. In the period 2003-2005, the average underpricing is remarkably low, but is significantly increased by 2006.

Table 1: Underpricing across year

Year	No. of observations	Average initial return	Median	St.dev	Total proceedings (NOK)
2003	2	-2.26 %	N/A	9.82%	367,500,000
2004	11	1.89 %	0.00 %	5.34%	1,915,589,640
2005	25	2.50 %	1.54 %	8.26%	9,112,596,150
2006	16	6.65 %	4.96 %	9.91%	12,426,005,008
2003-2006	**54**	**3.35 %**	**1.54 %**	**8.48%**	**23,821,690,798**

Table 1 *displays average underpricing and proceedings across years.*

The period from the 4th quarter in 2004 to the 3rd quarter in 2005, and furthermore the 1st-3rd quarters in 2006, are defined as hot periods according to the definition developed in the methodology chapter. The average underpricing in the hot markets is 5.6 %, while the same

[3] Calculated by multiplying proceedings with the average underpricing.

is reported to be 1.07 % in the cold markets. Further statistics on this are presented in appendix 2 (*table A5*).

There is a variance between sectors as well, where the energy and information technology sectors experience the highest average underpricing (6.17 % and 4.58 % respectively).

In terms of proceedings, the information technology sector on average raised the most capital through IPOs, compared to other sectors. The average proceeding in this sector (NOK 822 million) is nearly twice is high as in the energy and industrials sectors (NOK 453.6 and 452.9 million respectively). Further statistics across sectors are presented in appendix 3 (*table A6*).

Furthermore, as seen from table 2, the average underpricing for IPOs with venture capital backing is in fact higher than for non-venture capital IPOs. This contradicts the proposal that firms with venture capital suffer less from underpricing (Megginson and Weiss, 1991). However, other effects are likely to play in. Venture capital backed firms are, as an example, on average younger when they go public. This may indicate on higher ex ante uncertainty.

On the other hand, companies that use bookbuilding methods are connected to a lower average underpricing. Nine of the companies in the sample use fixed price offerings, with an average underpricing of 8.72 %. As may also be seen, IPOs that use bookbuilding methods raise twice as much capital as fixed price offerings.

Table 2: Descriptive statistics on initial returns across firm and offering characteristics

Firm/offer characteristics	**No. of obs.**	**Mean**	**Median**	**St.dev**.
Venture Capital backing	22	4.14 %	0.09 %	8.85%
Non-venture capital backing	32	2.97 %	1.54 %	8.08%
Hot market	28	5.6 %	2.83 %	7.67 %
Cold market	26	1.07 %	0.00 %	8.72 %
Fixed price offering	9	8.72 %	8.42 %	7.74 %
Bookbuilding	45	2.38 %	0.00 %	10.37 %
B2C	14	2.20 %	1.67 %	8.92 %
B2B	40	3.91 %	0.00 %	8.39 %

Table 2 *displays descriptive statistics on the initial return across firm and offering characteristics*

Concerning media exposure, there is a significant increase in media hits in the month of going public (*table 3*). The average number of media hits is significantly higher in the month prior to and in the month after the listing (7.25 and 6.98). The average more than doubles from the second month prior to being listed, to the listing month. However, the average number of news items drops to the approximate same level in the second month after the listing. This may indicate that the media attention gained by going public does not appear to be persistent.

Table 3: Descriptive statistics on media exposure

	Mean	Median	StDev
NI_{-1week}	1,623	1,000	1,934
NI_{Sub}	2,585	2,000	2,818
$NI_{-2\ months}$	2,717	2,000	3,146
$NI_{-1\ month}$	5,811	5,000	4,570
$NI_{+1\ month}$	6,585	5,000	5,882
$NI_{+2\ months}$	3,075	2,000	3,234

Table 3 *displays average and median media coverage for each media observation period*.

As expected, as seen from table 4, B2C companies receive more attention from the media than B2B companies. There are in total 14 B2C companies in the sample. These are subject to more media exposure in all the observation periods. It is, however, interesting to notice that this gap increases around the time of going public. While the difference is not even statistically significant one month before the listing ($NI_{-2\ months}$), B2Cs receive twice as much media attention in the month after the listing (10.71 news items on average, compared to 5.10 for B2B companies).

In terms of media exposure and price revisions, it is difficult to see any clear patterns. However, companies which have made an upwards price revision receive nearly twice as much press attention in the month after going public. Furthermore, the average number of news articles in the subscription period differs only marginally depending on an upwards and a downwards price revision (2.7 articles compared to 2.9 on average). This is somewhat surprising. According to *hypothesis 2a*, there should be an asymmetric relationship depending on the direction of the price revision. However, NI_{Sub} and the relative price

revision variable display a negative Pearson correlation coefficient (See appendix 5 for Pearson correlation coefficient matrix).

It is also worth noticing that IPOs that use bookbuilding methods receive more media attention in all the observation periods, except in the second month ex post. The difference is particularly large in the subscription period (2.8 compared to 1.1 on average).

Furthermore, regarding media exposure and the initial return, it is worth noticing that overpriced offerings on average receive significantly more media attention in the subscription period than underpriced offerings (appendix 3, *diagram A2*). However, this is reversed when it comes to ex post media exposure, where highly underpriced offerings receive more media exposure (appendix 3, *diagram A3*).

Table 4: Descriptive statistics on media exposure across firm and offer characteristics

Offer/firm characteristics	NI $_{-2\ months}$	NI $_{-\ 1\ month}$	NI$_{+1\ month}$	NI$_{+2\ months}$	NI$_{-1\ week}$	NI$_{Sub}$
Venture	2.39	5.94	6.45	2.90	1.32	2.45
Non-venture	3.18	5.64	6.77	3.32	2.05	2.77
Hot	3.28	6.88	6.32	2.72	1.72	3.12
Cold market	2.21	4.86	6.82	3.39	1.54	2.11
Fixed price offering	1.67	3.44	4.22	4.11	0.89	1.11
Bookbuilding	2.93	6.30	7.07	2.86	1.77	2.89
B2C	3.71	7.79	10.71	3.43	2.36	3.79
B2B	2.36	5.10	5.10	2.95	1.36	2.15
Upwards price revision	3.05	6.63	9.47	2.63	1.84	2.74
Downwards price revision	2.92	6.04	5.50	3.23	1.69	2.92

Table 4 *displays the average news hits for each observation period across offering and firm characteristics*

Pearson's correlation tests for underpricing and media exposure show negative coefficient values for all the media variables, but for $NI_{+1\ month}$. However, the coefficients are remarkably low, except for NI_{Sub}, which display a significant negative correlation with the initial return variable (Pearson correlation coefficient matrix is presented in appendix 5).

As a temporary summary on the descriptive statistics, there is underpricing present, even though it is somewhat low compared to previous studies. Furthermore, there seems to be a variance in underpricing depending on offering and firm characteristics. Media coverage is also significantly increased in the month of the IPO. However, media exposure does not

seem to be persistent. Finally, Pearson's correlation coefficients indicate a relationship between underpricing and media exposure, depending on which observation period is looked at.

6. Multivariate analysis and discussion

So far, there appears to be a relationship between media exposure and initial return. However, other effects might cause these apparent relationships, and tests, which include control variables, are carried out.

6.1 Ex ante media exposure on underpricing

To test for whether media coverage in the time before going public is related to the initial return, the following multiple regression is run:

$$InitialReturn = \beta_0 + \beta_1 * 'NI_t' + \beta_2 * 'MShare' + \beta_3 * 'OvrSub' + \beta_4 * 'lnAge' + \beta_5 * 'PrRev' + \beta_6 * 'Book' + \beta_7 * 'Venture' + \beta_8 * 'Hot'$$

6.1.1 Results

The results, reported in regression 1 (*table 5*), show that media exposure in the week prior to going public ($NI_{-1\ week}$) is not significantly related to underpricing. This is rejected on a rather high significance level (p-value = 80 %). The rejection is in contradiction to DuCharme and Rajgopal's (2001) article, as well with Staikouras and Tsatsanis (2004). The results therefore do not support the argument that media coverage in the week prior to going public affects demand in the aftermarket.

When it comes to media exposure in the subscription period (NI_{sub}), a significant negative relationship to the initial return is shown (results presented in regression 2*, table 5*). According to the regression, each article reduces underpricing by 0.7 %. This is significant at a 10 % level. However, note that this is after removing the percentage price revision variable. This is removed due to its correlation with the oversubscription ratio and the hot market dummy. The removal however, does not change the value of the underpricing coefficient.

Furthermore, when including the variables, which measure media coverage for negative and positive price revisions separately, the relationship is asymmetrical. *'NegativeNews'* (equal to the number of news items if there is a negative price revision in the initial price range, and zero otherwise) is negatively related to underpricing. However, this is not true for the opposite variable, *'PositiveNews'* (equalling the number of news items if there is a positive price revision). *'NegativeNews'* is significant at a 5 % level, displaying a coefficient which is equal to -0.9 %.

The economic significance of these findings suggests that for each additional news article in the subscription period, the issuer left NOK 3.09m less on the table. This is based on the average proceeding per IPO (NOK 441m). The effect is even stronger for companies that revise their offering price downwards in the subscription period. Each article was followed by a NOK 3.97 million reduction.

Table 5: Regression results on the initial return as the explained variable

	Regression 1	**Regression 2**
Constant	-0.02756 *(-0.97)*	-0.00693 *(-0.24)*
'NI_t'	0.001223 *(0.22)*	-0.00718* *(-1.91)*
'MShare'	-0.1038 *(-0.75)*	-0.0625 *(-0.46)*
'OverSub'	0.008328*** *(3.78)*	0.00909*** *(4.23)*
'lnAge'	0.005139 *(0.62)*	0.004786 *(0.62)*
'Book'	-0.07236** *(2.67)*	-0.05904** *(2.24)*
'Venture'	-0.00061 *(-0.03)*	0.0042 *(0.21)*
'Hot'	0.00907 *(0.39)*	0,00017 *(0.01)*
R^2 (adj)	*27.7 %*	*33.1 %*

*Numbers in parentheses display t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

***Table 5** displays the results of a multivariate analysis on the relationship between underpricing and ex ante media exposure. 'Regression 1' tests this relationship using media coverage in the week prior to the offering, while 'Regression 2' uses the media exposure in the subscription period.*

6.1.2 Discussion

There is no evidence present in this sample for claiming that media in the week prior to going public fuels any demand in the aftermarket. It must though be underlined that the results are based on a small sample, and must be interpreted with a great caution. However, a couple of reasons may support the failure to find a significant relationship. To begin with, DuCharme and Rajgopal's (2001) study a pure sample consisting of Internet companies, while this sample has companies from a wide range of industries. Furthermore, they study a sample from the Internet bubble period, a time when extreme underpricing and media interest was experienced. Ritter and Welch (2001) argue that the high underpricing in this period should be explained by behavioural and agency conflict theories. It is, however, reasonable to believe that there has been a shift in investor psychology since then, implying that media hype does not drive underpricing.

When it comes to media coverage in the subscription period, the finding of a negative relationship does not support that media coverage can be used to prove Benveniste and Spindt's model (1989). According to Liu, Sherman and Zhang's (2006) proposal, informed investors repeat their private information to the media after revealing it to the issuer. Furthermore, they argue that investors would do so in order to increase the demand in the aftermarket to induce a quick return ('*flipping'*).

However, the counterargument would be that most investors have a longer time perspective. Aggarwal (2003) reports in his study of US IPOs, that flipping accounts for only 19 % of the trading volume in the first two days after the listing. He also found that hot IPOs are more likely to be flipped, than cold IPOs. Furthermore, investment banks are in general reluctant to permit flipping, because it drives stock prices downward, he says. The failure of finding a positive relationship here could therefore be due to informed pre-market investors not attempting to stimulate the immediate demand in the aftermarket in order to flip. In addition, investors may expect that pre-listing media coverage has no or only a small effect on the aftermarket demand, as reported above.

The negative relationship, on the other hand, is likely to be due to media coverage in the subscription period related to a reduced adverse selection in the pre-market. The results are

thereby more consistent with the winner's curse model developed by Rock (1986). This would imply that the uninformed investor's fear of a winner's curse reduces with increased media coverage.

Furthermore, the results give support for claiming that there is a negative asymmetric relationship in the sample, even though the evidence is weak. This is based on underpricing being negatively related to media coverage when there is a downwards price revision in the initial price range. According to the regression results, each published news article in the subscription period is followed by 0.9 % lower underpricing when the offering price is set below the midpoint. However, there is no significant positive relationship when the price is adjusted upwards. It must though be emphasized that the possibility of a type 1 error (rejection of a true null hypothesis) is most present here, due to a small sample.

A negative asymmetric relationship contradicts with Liu, Sherman and Zhang's (2006) proposal. However, one can still find rational arguments to the finding. To begin with, one should be aware that a negative price revision does not necessarily mean that negative information is revealed. It could, on the other hand, also reflect that the midrange of the price range is close to the real value. This could furthermore imply that the preliminary research conducted by the issuer and its underwriters has revealed most of the relevant information regarding the valuation. Thereby, in accordance with Benveniste and Spindt's model (1989), institutional investors would have little positive information to contribute, which would reduce their incentives to participate in the offering.

Due to the moderate interest among institutional investors, reflected by the negative price revision, it would be reasonable to assume that issuers put more effort into promoting the offering to retail investors. Furthermore, news articles where the company explains their competitive advantages, business model, business risk, choice of underwriter, company funding etc. would probably educate the uninformed investors and reduce the fear of a winner's curse. In this case, the findings would be in line with Rock's model (1986).

Alternatively, though not necessarily in conflict with the argumentation above, there is likely to be a bias due to endogeneity. This would imply that media coverage is somehow dependent on underpricing. Possibly, one might think that the press prefers to report on offerings which are surrounded by little information asymmetry. Keep in mind that the media is reliant on its reputation. It would therefore be reasonable to regard newspapers'

credibility as a function of the accuracy in what they report. In this context, one could assume that journalists would prefer to write stories on companies or industries which they have prior knowledge of, or on information that can be easily certified. Assuming that the press' willingness to report on an offering is positively dependent on the reliability of public information, media coverage would increase when there is a high probability of a low underpricing.

To test for endogeneity, a Hausman test is run (the proceedings and results of this test are presented in appendix 6). This test displays that endogeneity is present, which is significant at a 1 % level. However, it may seem that underpricing still has a rather small effect on media coverage in the subscription period. The coefficient value of the *'InitRet'* coefficient in the first step regression,[4] is estimated to be -7.71. This implies that when underpricing is decreased by one per cent, media coverage only increases by 0.0771 articles. Furthermore, NI_{Sub} is only marginally reduced in the second step. It may therefore seem as if endogeneity is present, but does not have any significant impact.

A third alternative explanation however, is more obscure, but still possible. This is based on the observation that overpriced offerings receive significantly more media attention in the subscription period. I therefore test whether media exposure is determined by the probability of overpricing. An argument for such a relationship could be that analysts or similar experts may use the media to warn investors from investing in overpriced stocks, perhaps in order to gain reputation and credibility (or informed competitors may want to discredit the offering).

A regression using *'*NI_{Sub}*'* as the explained variable is run. This model is controlled against the media exposure control variables, described in the methodology chapter. In addition, a dummy for overpricing is added, which is equal to one if there is a negative first day return on the IPO shares, otherwise zero.

The results of this regression show that media coverage is negatively dependent on underpricing. Furthermore, the media coverage is positively related to the overpricing dummy, but insignificant at a rather high level (p-value = 50 %). I thereafter run a regression where I add a variable which is equal to negative initial returns (overpricing), but zero for

[4] The Hausmann test method uses a two-step procedure. In the first step, a regression on NI_{Sub} is run as the explained variable. While in the second step, a regression on InitRet is run, with the fitted values from the first step as a regressor. A more detailed explanation on the procedure is provided in the appendix.

positives (underpricing). This variable (named '*overprice'*), is insignificant as well (even when removing *'Initret'* and the dummy). In addition, it does not seem plausible to believe that the media is better informed than pre-market investors are. I therefore choose to reject this possibility. The results are presented in appendix 4 (*table A10*).

6.1.3 Analysis of control variables

Regarding the control variables, percentage price revision from the bookbuilding midrange, the bookbuilding dummy and the oversubscription ratio variables show significant relationships to underpricing. They are all significant at a 5 % level. However, note that the percentage price revision variable is not significant even at a 10 % level. This is, however, probably due to multicollinearity. Preliminary tests show that this variable is correlated to both media coverage and the oversubscription ratio (appendix 5). However, a regression, which excludes media coverage and oversubscription, displays that percentage price revision is significantly positively related to underpricing. This supports the partial adjustment argument.

It is, furthermore, notably that the fixed price offering dummy is significant and displays a rather high coefficient value. According to the coefficient estimate, underpricing increases by 6 % when a fixed price offering method is used. This is in accordance with Benveniste and Spindt's suggestion (1989), saying that private information is revealed through bookbuilding. However, the results are somewhat interesting since Ljungqvist, Jenkinson and Wilhelm (2003) report that bookbuilding methods are most effective when the IPO is lead by a US investment bank. In fact, their findings show that European fixed price offerings proved to suffer less from underpricing, than IPOs using bookbuilding methods. They argue that US banks have an advantage due to more experience in bookbuilding and better access to informed US investors. Since this sample is dominated by Scandinavian investment banks, these results may imply that the regional investment banks are in possession of the needed experience and utilize the advantages of bookbuilding methods. However, since there are rather few fixed price offerings in a rather small sample, these results should be interpreted with the greatest caution.

When it comes to the insignificant variables, they should still be discussed due to the probability of a type 1 error.

To begin with venture capital, it is surprising to see that this variable displays a positive coefficient. As mentioned, previous studies (e.g. Megginson and Weiss, 1991) suggest that venture capital participation acts as a certification and thereby reduces the adverse selection problem. However, the venture capital industry is still in its early stages in Norway, and the lack of relationship could be due to the venture capital industry not having yet built a sufficient reputation to act as a reliable signal in IPOs. In addition, it must be added that the construction of the variable as a dummy, does not take the quality of the venture capital participation into account. A more accurate measurement of venture capital reputation could have given another picture.

The underwriter market share and firm age variables display respectively negative and positive relationships in all regressions. This is expected and in line with the literature. The lack of significance could be due to the small sample, as much as to a lack of relationship. Furthermore, it is worth questioning whether the results could have been different if one had used the Carter-Manaster tombstone method (Carter and Manaster, 1990) to proxy for underwriter reputation.

The hot period variable is insignificant at a high significance level (close to 100 %). In addition, its coefficient is remarkably low, which implies on that a hot period only increases underpricing by 0.02 %. This must be regarded as economically insignificant.

6.2 Underpricing on ex post media exposure

In testing *hypothesis 3,* the impact of underpricing on ex post media coverage, the following regression is run:

$$NI_t = \beta_0 + \beta_1 * \text{'Initret'} + \text{'}\beta_2\text{'lnProc'} + \text{'}\beta_3 * B2C\text{'} + \beta_4 * \text{'MShare'} + \beta_5 * \text{'Venture'} + \beta_6 * \text{'Hot'}$$

6.2.1 Results

The results show a positive relationship between underpricing and media exposure in the first month after going public. This is significant at a 10% level. For every underpricing percentage, media coverage increases by 0.15 articles, or one article per 6.67% underpricing. In absolute numbers, NOK 29.41 million is left on the table per article.

However, when the observation period is set to the second month after the listing ($NI_{+2\ months}$), none of the independent variables display any significant relationship to media coverage. The R^2-value is furthermore close to zero, indicating that the designed model has no explanatory power. This is true even when changing model specifications, e.g. by transforming variables into their natural logarithm and square root.

Table 6: Regression results on ex post media exposure as the explained variable

	Regression 3	**Regression 4**
Constant	-12.437	0.95
	(-1.29)	(0.15)
'Initret'	15.383*	-2.744
	(1.72)	(-0.48)
'lnProc'	0.8222	5.219
	(1.57)	(0.82)
'B2C'	5.86***	0.0474
	(3.48)	(0.14)
'Venture'	0,6	0.5283
	(0.39)	(0.55)
'MShare'	11.211	0.602
	(1.12)	(0.56)
'Hot'	0.598	0.711
	(0.38)	(0.71)
R^2 (adjusted)	20.50 %	0.00 %

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

***Table 6** displays the results of a multivariate analysis on the relationship between underpricing and ex post media exposure. 'Regression 3' reports the estimates for the regression run on $NI_{+1\ month}$ as the explained variable, while 'Regression 4' is run on '$NI_{+2\ months}$'.*

6.2.2 Discussion

The positive relationship between $NI_{+1\ month}$ and the initial return is expected and in line with previous studies. It is therefore reasonable to conclude on that underpricing is statistically related to increased publicity in the month after going public.

However, despite of the statistical relationship, it is still worth elaborating on the economic significance. The money left on the table per article exceeds what is reasonable to believe the average firm would be willing to pay for marginal publicity. As a comparison, one could mention that a double page advertisement in Dagens Næringsliv costs NOK 348,150 (June 11th 2007, www.dn.no).

A back of the envelope calculation, assuming that a news item is worth NOK 1 million (which is probably a conservative estimate), shows that the motivation for increased publicity only accounts for approximately 3 % of the money left on the table[5]. It therefore seems reasonable to argue that product marketing benefits are rather insignificant in explaining underpricing on the OSE.

As an argument supporting this, one could point out that only 14 out of 54 companies in the sample are categorized as B2C companies. In addition, it is worth mentioning that the energy sector accounts for more than 50 % of the OSE's total market capitalization (figures from 24 January 2007, www.ose.no). Furthermore, Norway is normally regarded as a small and an open economy, where a significant part of the trade is reliant on international markets. It is therefore reasonable to assume that increased domestic publicity is not an important factor in terms of product marketing when going public on the OSE.

One should though, be aware that the economic significance would probably be larger if news from *Finansavisen*, international media, broadcastings and internet media were included in the media variables.

[5] 1 million divided by the average underpricing (in absolute numbers) per article.

However, though product marketing aspects seem to play a minor role in explaining underpricing on the OSE, increased publicity still could have positive effects. Among others, it is reasonable to assume that media coverage raises awareness of a company among aftermarket investors. This may lead to better terms in the capital market at a later stage. In this context, it is worth noticing that the relationship between media coverage and the initial return switches signs in the time between the IPO subscription period and the listing. It is reasonable to assume that the latter group of firms relates to more ex ante uncertainty due to its larger underpricing. However, after going public, these firms receive more media coverage, which may decrease the related asymmetric information problem assumed prior to going public. This study however, does not offer any evidence to make any conclusion regarding this suggestion.

When it comes to media exposure in the second month after the listing, no significant statistical relationship to underpricing is found, but remains robust even when changing model specifications. It is therefore reasonable to conclude that the developed model is only able to explain media exposure in the immediate time after going public. I therefore choose to reject that underpricing has a persistent effect on publicity. However, there are likely to be variables outside the model causing media coverage. The exclusion of a significant variable can induce type 1 errors, and the interpretation of these results should be conducted with caution (Brooks, 2002).

6.2.3 Analysis of control variables

Among the control variables, only the B2C dummy displays a significant coefficient value when including all the control variables in a regression on $NI_{+1\ month}$. However, when removing insignificant variables (*lnAge, Venture* and *Hot*) and running *MShare* and *lnProc* in separate regressions, both of these variables are statistically significant (table A12, appendix 4). This is done due to the suspicion of multicollinearity.

These findings therefore suggest that there is positive relationship between ex post media coverage and underwriter's reputation. Furthermore, the offering size coefficient also displays a positive sign, indicating that aftermarket publicity is positively related to the size

of the IPO. The findings also show that B2C companies are subject to significantly more media coverage in the first month after the listing.

In terms of the insignificant variables, they are all rejected at a high significance level (over 50 %). However, it is still worth mentioning that the hot market and the venture dummies show positive signs. *lnAge*, on the other hand, displays a negative sign.

Regarding the control variables included in the regression run on $NI_{+2\ months}$, I choose to not elaborate on these, due to the model's low explanatory power.

7. Robustness

The results so far show that IPO underpricing is significantly related to media coverage in the subscription period and ex post listing. A number of concerns, however, arise in discussing these findings. Most important is the size of the sample, which is crucial in evaluating the validity. Compared to most international studies referred to, the size of this sample is rather small.

However, some robustness checks are made in order to test the results. To begin with, the findings are robust when they are controlled against variables that are assumed to be related the explained variables. Furthermore, all the variable coefficients which are central to the scope of this study and reported as significant, are stable even when removing insignificant control variables one by one, and in different combinations. This is important since multiple regressions on small samples are sensitive to the number of variables used (Brooks, 2002).

The rejection of *hypothesis 1* should though, be elaborated on, since there is a possibility of a type 1 error. The rejection is, however, robust even when removing coefficients in different combinations. $NI_{-1\ week}$ change coefficient values and even signs, which indicate on sensitive estimates dependent on changing model specifications. In addition, it seems plausible that the investor psychology of this sample differs from what DuCharme and Rajgopal (2001) build their study on.

Furthermore, a few extreme observations are made, which could greatly influence the coefficients in all the regressions. These could also violate the assumptions of the Ordinary Least Square method (Brooks, 2002). I therefore remove '*Aker Kværner'* (due to extreme media coverage), '*SeaBird Exploration'* (extreme underpricing) and *'Grenland Group*' (extreme underpricing) from the sample. These are removed due to suggestions from the statistical software (Minitab).

The removals however, do not change the statistical significance of the relationship between media coverage and underpricing. On the other hand, the coefficients are somewhat reduced. However, underwriter's reputation, the hot market dummy and age all now turn out to be significant, at a 10 % level. This is in line with theory suggestions, supporting that these are significantly related to underpricing. However, the fixed price offering dummy now turns out to be insignificant, and its coefficient is remarkably reduced (but still positive). This is

probably due to Grenland Group's fixed price offering, and I therefore do not reject that the IPO method is related to underpricing. The results of these regressions are presented in appendix 4 (table A14 and A15).

However, concerns are present. As pointed out, there is likely to be a simultaneous causality between NI_{Sub} and the initial return. A Hausman test shows that NI_{Sub} cannot be rejected as an endogenous variable. On the other hand, it must be underlined that a Hausman test would preferably require a larger sample than the case here. The results from this test should therefore be interpreted as an indication of simultaneity. It would therefore be desirable to examine the implication of simultaneity on a larger sample.

Another major concern relates to the data on oversubscription ratios. The reader should be aware that the original data is missing information on the oversubscription ratios for eight companies. These companies were reluctant to reveal this information. For the missing cases, I have therefore chosen to set the ratio to one. I argue that the reason why this information is not made public is most probably that the offering has not been oversubscribed.

In any case, even after robustness checks, the findings should be interpreted with great caution. A study on a larger sample would be highly desirable.

8. Conclusion

This thesis has examined the relationship between ex ante media coverage and underpricing, and secondly, how underpricing affects ex post media exposure.

The findings show that media coverage in the subscription period is significantly negatively related to underpricing. Companies that were followed by the media left NOK 3.09 million less on the table per news article. Furthermore, I also find (weak) evidence to conclude that media coverage is asymmetrically related to underpricing. The relationship depends on whether the price revision is revised upwards or downwards from the midpoint of the bookbuilding price range. When prices are revised downwards, there is a significant relationship. However, there is no evidence of a significant relationship in the opposite direction, implying an asymmetric relationship.

However, due to suspicion of endogeneity, I do not make any conclusion about causality. On the other hand, I would suggest that future studies on this topic examine the likely effect of simultaneity (e.g. by using a 2SLS method). This could give a clearer picture of the underlying cause to the relationship.

However, the findings still show that offerings that receive media coverage are related to lower underpricing.

I furthermore reject the hypothesis claiming that media coverage in the week prior to going public creates hype, fuelling the demand for the shares in the aftermarket. Such particular explanations arose in connection with the Internet bubble, but there is no evidence present for such a proposal here. This is probably because this sample contains IPOs from a wider range of industries and from a different period than is the case for studies focusing on the dotcom era.

When it comes to underpricing and media exposure in the time after going public, there is a significant positive relationship in the first month ex post. This finding is in accordance with those of previous studies.

However, despite the finding of a positive relationship, I still reject that underpricing is deliberately motivated by product marketing benefits. This is based on the economic insignificance of the findings. According to the results, if the sole purpose of underpricing

was to increase publicity, it would cost on average, NOK 29.4 million to achieve one additional news article. This figure must, however, be regarded as an upper limit, since there are various motives behind underpricing. A back of the envelope calculation, assuming that one additional article is worth NOK 1 million, shows that the marginal publicity only accounts for approximately 3 % of the money left on the table. I therefore find that product marketing benefits play a rather minor role in explaining underpricing on the OSE.

However, I suggest that increased publicity, which is related to underpricing, can still have a positive impact in order to achieve better terms when returning to the primary capital market. This study does not investigate this possibility. A study on the relationship between the OSE performance and IPO media exposure is therefore suggested.

Furthermore, I find reasons to reject that underpricing has any persistent effect on media coverage, since there is no significant relationship between underpricing and media coverage in the second month after the listing. This is also in line with previous findings from literature.

However, the analysis is based on a small sample, and all of these findings should therefore be interpreted with the greatest caution. The conclusion should therefore be that a relationship between media exposure and IPO performance is shown, which is worth closer investigation, preferably on a larger sample

For future studies, I would furthermore find it interesting to investigate how different news characteristics are related to underpricing. This would require categorization of news depending on what is reported, giving a more detailed picture on the interplay between media exposure and IPO performance. This is not included in this study due to time constraints.

As a final remark, even though it is not within the scope of this thesis, I also find it worth mentioning the high number of companies going public without making any public offering. An article by Derrien and Kecskès (2007) examine such listings on the London Stock Exchange, and point out a list of possible explanations to this phenomenon. I therefore suggest that future studies might investigate why companies go public on the OSE without making any public offering.

Appendix

Appendix 1: Sample selection

Table A1: Sample

Company name	Ticker	Date of listing	Company name	Ticker	Date of listing
Ability Group	AGR	03.07.2006	Grenland Group	GGG	12.12.2005
Active 24	ACTIVE	12.11.2004	Havila Shipping	HAVI	24.05.2005
Aker American Shipping	AKASA	11.07.2005	Kongsberg Automotive Holding	KOA	24.06.2005
Aker Kværner	AKVER	02.04.2004	Mamut ASA	MAMUT	10.05.2004
AKVA Group	AKVA	10.11.2006	Marine Farms	MAFA	12.10.2006
APL ASA	APL	18.03.2005	Media & Research Group	MRG	23.09.2005
Artumas Group Inc.	AGI	08.07.2005	Medi-Stim	MEDI	28.05.2004
Awilco Offshore	AWO	11.05.2005	NextGenTel Holding	NEXT	19.12.2003
Bergesen Worldwide Gas	GAS	25.10.2005	NorDiag	NORD	14.12.2005
Biotec Pharmacon	BIOTEC	04.11.2005	Norgani Hotels	NORGAN	16.11.2005
Bjørge	BJORGE	17.12.2004	Norway Energy & Marine Insurance	NEMI	07.06.2005
Block Watne Gruppen ASA	BWG	17.03.2006	Norwegian Air Shuttle	NAS	18.12.2003
Camillo Eitzen & Co	CECO	28.06.2004	Norwegian Property	NPRO	15.11.2006
Catch Communications	CATCH	29.03.2004	Odim	ODIM	18.11.2005
Cermaq	CEQ	24.10.2005	Opera	OPERA	11.03.2004
Clavis Pharma	CLAVIS	07.07.2006	Oslo Areal ASA	OSLO	03.05.2005
Codfarmers	COD	19.10.2006	Pertra	PERTRA	10.11.2006
Consafe Offshore	CONSA	26.09.2005	Petrobank Energy and Resources Ltd	PBG	08.02.2006
Conseptor	CNS	24.06.2004	Petrojack ASA	JACK	23.02.2005
Crew Minerals	CMI	21.12.2006	Polimoon	POLI	26.04.2005
Dolphin Interconnect Solutions	DOLP	20.04.2006	Powel	POWEL	24.10.2005
DynaPel Systems	DYNA	27.01.2005	Renewable Energy Corporation	REC	09.05.2006
Eidesvik Offshore	EIOF	27.06.2005	Revus Energy	REVUS	27.06.2005
Eitzen Chemical	ECHEM	02.11.2006	SeaBird Exploration Ltd	SBX	11.04.2006
Faktor Eiendom	FAKTOR	08.12.2006	Sevan Marine	SEVAN	13.12.2004
Findexa Limited	FIND	25.05.2004	Trolltech	TROLL	05.07.2006
Funcom	FUNCOM	13.12.2005	Via Travel Group	VIA	09.06.2005

Table A1 *presents the sample selection. The companies are organized in their alphabetical order.*

Appendix 2: Construction of variables

Table A2: Definitions of the explained and the independent variables

Name of variable	Definition
InitRet	P_1/P_0 -1
Constant	Constant
NI_t	News hits in t weeks/months after (before) the listing
PositiveNews	Equal to NI_{Sub} if the offering price is set above the midpoint of the indicative price range. If otherwise equal to zero
NegativeNews	Equal to NI_{Sub} if the offering price is set below the midpoint of the indicative price. If otherwise equal to zero.
MShare	Underwriter's share of the total proceedings in the sample
Oversub	Number of offered shares divided by subscription demand
PrRev	Percentage price revision from the midpoint of the initial price range
Book	Dummy variable. Equal to 1 if the offering is carried out using a bookbuilding method.
Venture	Dummy variable. Equal to 1 if the company has venture capital backing.
Hot	Dummy variable. Equal to 1 if the observation lies within a period defined as a hot period.
lnAge	The natural logarithm of the company age.
lnProc	The natural logarithm of the IPO gross proceedings
B2C	Dummy variable. Equal to 1 if the company is a Business-to-Consumer oriented firm. Otherwise equal to zero

Table A3: Definitions of media exposure variables

Variable	Observation period begins	Observation period ends
$NI_{-1\ week}$	One week prior to the listing	One day prior to the listing
NI_{Sub}	First day of subscription period	Last day of the subscription period
$NI_{+1month}$	Date of the listing	One month minus one day after the listing
$NI_{+2\ months}$	One month after the listing	Two months minus one day after the listing

Table A4: Underwriter market share

Underwriter	Market share
Carnegie	25.76 %
ABG Sundal Collier	17.97 %
UBS	14.79 %
Enskilda	11.71 %
Pareto	8.18 %
DnB	6.37 %
Goldman Sachs	1.41 %
CIBC World Markets	1.41 %
Alfred Berg	0.37 %
Fernley Fonds	0.25 %
First Securities	0.25 %
Handelsbanken	0.15 %

*As seen from **table A4**, six investment banks dominate the Norwegian IPO industry, capturing nearly 85 % of the market. It should though be mentioned that a few IPOs give a high contribution to some of the market shares. E.g. Renewable Energy Corporation and Bergesen Worldwide Gas, raising respectively NOK 6.9 and 4.2 billion through their IPOs, accounting for 46 % of the total proceedings in the sample.*

Table A5: Hot/cold markets

Time period	Hot/cold market issue	Average initial return
2003 Q1	N/A	N/A
2003 Q2	N/A	N/A
2003 Q3	N/A	N/A
2003 Q4	Cold market issue	-2.26 %
2004 Q1	Cold market issue	-0.50 %
2004 Q2	Cold market issue	0.94 %
2004 Q3	N/A	N/A
2004 Q4	Hot market issue	3.66 %
2005 Q1	Hot market issue	10.09 %
2005 Q2	Hot market issue	2.78 %
2005 Q3	Cold market issue	-3.51 %
2005 Q4	Cold market issue	2.37 %
2006 Q1	Hot market issue	10.94 %
2006 Q2	Hot market issue	23.08 %
2006 Q3	Hot market issue	3.22 %
2006 Q4	Cold market issue	0.70 %

***Table A5** shows the average initial return across annual quarters. A hot market is defined as a quarter when the average initial return exceeds the median initial return for all quarters (0.02370). As seen, there is a relatively small variance across the periods, except the first quarter of 2005, and furthermore the first and the second quarter of 2006, where one may observe relatively high initial returns.*

Appendix 3: Descriptive statistics

Diagram A1: Sample distribution

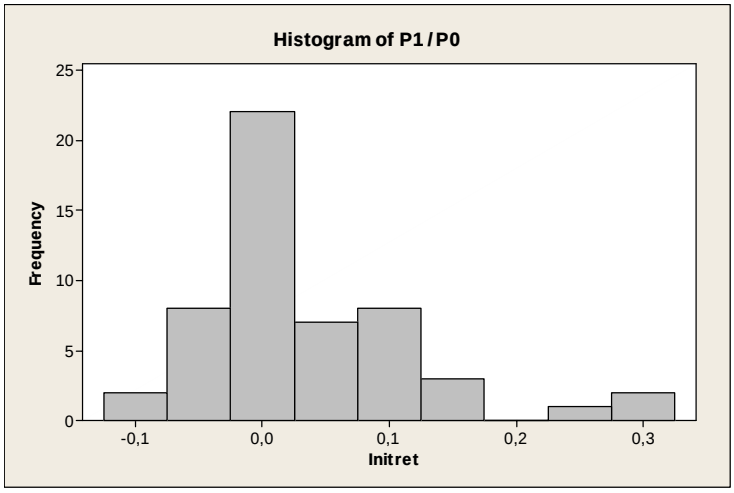

Diagram 1 *displays the distribution of offerings across intervals of underpricing.*

Table A6: Underpricing across sectors

	N	Mean initial return	Median initial return	Mean Offer size (NOK)
Consumer Discretionary	6	1.27%	-0,00.43%	370,358,333
Consumer Staples	3	-1.68%	-1.43%	117,000,000
Energy	16	6.17%	2.83%	453,638,262
Financials	5	2.21%	1.89%	244,539,998
Health Care	4	2.97%	2.23%	54,897,245
Industrials	6	2.17%	1.66%	452,948,273
Information Technology	11	4.58%	0.00%	822,375,000
Materials	2	-2.16%	-2.16%	392,112,500

Table A6 *presents the average and median initial return, and furthermore the mean offer size, across sectors.*

Table A7: Average media exposure across sectors

	$NI_{-2\ months}$	$NI_{-1\ month}$	$NI_{+1\ month}$	$NI_{+2\ months}$
Energy	2.44	4.06	6.25	3.31
Financials	2.00	5.80	2.60	0.80
Industrials	1.50	7.33	7.00	2.67
Consumer Staples	5.67	11.00	13.00	5.00
Health Care	3.25	3.75	2.75	1.00
Information Technology	2.64	6.55	8.55	4.18
Consumer Discretionary	3.33	7.17	6.83	3.33
Materials	3.50	3.50	4.50	2.50

Table A7 *presents the average media coverage for each observation period across sectors.*

Diagram A2: *'NI_{Sub}'* across intervals of underpricing

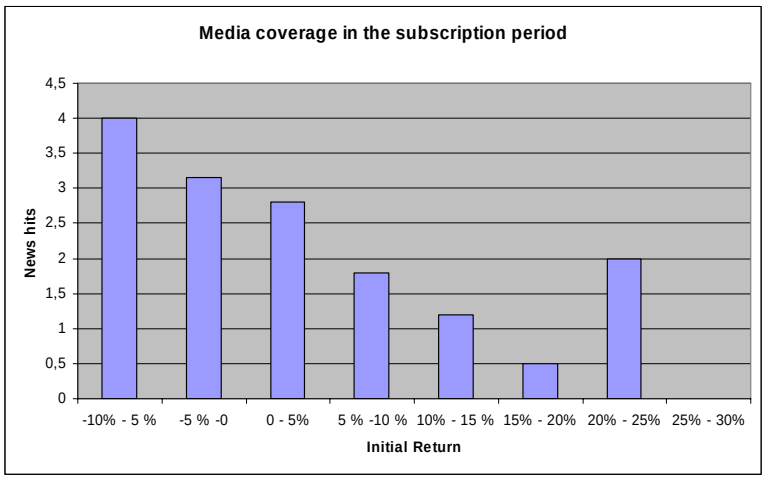

Diagram A2 *illustrates that the initial return is negatively correlated with media coverage in the subscription period.*

Diagram A3: *'$NI_{+1month}$'* across intervals of underpricing

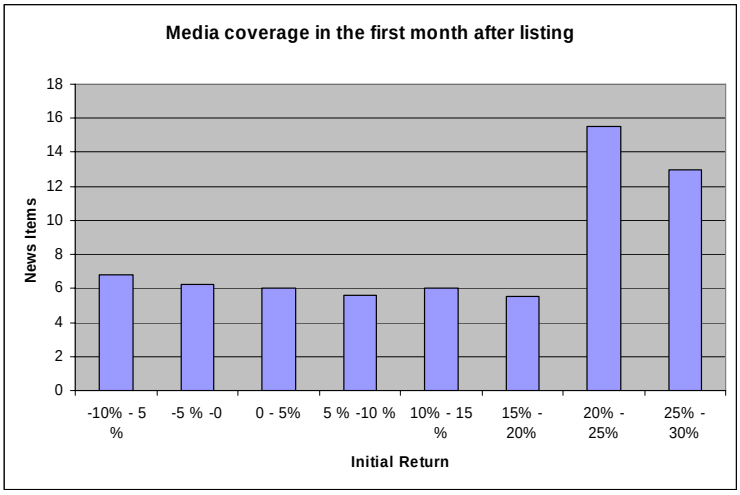

Diagram A3 *illustrates that highly underpriced offerings stand out in terms of media hits in the month subsequent to the offering. As seen, offerings that are underpriced above 20 % receive more than twice as much media attention on average. However, please, notice that only three offerings belong to this category.*

Appendix 4: Regression results

Table A8: Multivariate analysis on underpricing and '*NI$_{-1\ week}$*'

	Regression 1	Regression 2	Regression 3	Regression 4
'Constant'	-0.01179	-0.02756	-0.0133	-0.00015**
	(-0.4)	(-0.97)	(-0.83)	(2.26)
'NI$_{-1week}$'	-0.00032	0.001223	0.000597	0.03484
	(-0.06)	*(0.22)*	*(0.12)*	*(-0.02)*
'MShare'	-0.1319	-0.1038		
	(-0.96)	(-0.75)		
'OverSub'	0.007087 ***	0.008328 ***	0.008667 ***	
	(-3.08)	(3.78)	(4.34)	
'lnAge'	0.006746	0.005139		
	(-0.83)	(0.62)		
'Venture'	0.00675	-0.00061		
	(-0.32)	(-0.03)		
'PrRev'	0.1695			
	(-1.61)			
'Book'	-0.06556 **	-0.07236 **	-0.07052 ***	
	(-2.43)	(2.67)	(2.67)	
'Hot'	-0.00008	0.00907		
	(0.00)	(0.39)		

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

***Table A8** presents the regressions results of a multivariate analysis on the relationship between 'InitRet', and NI$_{-1\ week}$ (media coverage in the week prior to going public). 'Regression 1' includes all of the control variables described in chapter 3.3.1. In 'Regression 2' 'PrRev' is excluded due to a suspicion of multicollinearity. Furthermore, in 'Regression 3' all insignificant variables from 'Regression 2', except 'NI$_{-1\ week}$', are removed. In the final regression 'NI$_{-1\ week}$' is run as the only independent variable.. The results show that 'NI$_{-1\ week}$' is statistically insignificant in all the regressions. Furthermore, one should notice that the coefficient values of this variable are sensitive to changing model specifications.*

Table A9: Multivariate analysis on *'NI_{Sub}'* and underpricing I

	Regression 1	Regression 2	Regression 3	Regression 4
Constant	0.00116	-0.00693	0.00911	0.05429 ***
	(0.04)	(-0.24)	(0.59)	(3.5)
NI_{Sub}	-0.00611	-0.00718 *	-0.00839 **	-0.00762 *
	(-1.6)	(-1.91)	(4.92)	(-1.87)
MShare	-0.089	-0.0625		
	(-0.65)	(-0.46)		
OverSub	0.007977 ***	0.00909 ***	0.009358 ***	
	(3.46)	(4.23)	(-2.44)	
lnAge	0.005784	0.004786		
	(0.75)	(0.62)		
Venture	0.00866	0.0042		
	(0.42)	(0.21)		
PrRev	0.1328			
	(1.28)			
Book	-0.05668 **	-0.05904 **	-0.05563 ***	
	(2.16)	(2.24)	(2.2)	
Hot	-0.00556	0.00017		
	(-0.24)	(0.01)		

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

***Table A9** displays the regression results of the multivariate analysis on the relationship between underpricing and NI_{Sub} (media coverage in the subscription period. 'Regression 1' includes all the control variables described in chapter 3.3.1. Furthermore, in 'Regression 2' 'PrRev' is excluded due to a suspicion of multicollinearity. Furthermore, in 'Regression 3' all insignificant variables from 'Regression 2' are removed. Finally, in 'Regression 4' '$NI_{-1\ week}$' is run as the only independent variable.*

As seen, 'NI_{Sub}' is statistically significant when removing 'PrRev'. This may indicate on multicollinearity. Furthermore, 'NI_{Sub}' display stable coefficient values when run in regressions including different combinations of independent variables (please, note that all combinations are not presentetd). Regarding the control variables, 'Book' and 'OverSub' display statistical significance.

Table A10: Multivariate analysis on *'NI_{Sub}'* and underpricing II

	Regression 1	Regression 2	Regression 3
Constant	2.437 (0.48)	2.564 (0.51)	2.85 (0.55)
InitRet	-5.759 (-1.04)		
MShare	6.496 (1.30)	6.48 (1.31)	5.574 (1.11)
lnProc	-0.0984 (-0.35)	0.0875 (-0.31)	-0.1147 (-0.41)
Venture	0.3878 (0.49)	0.3675 (0.48)	0.302 (0.39)
$NI_{-2\ months}$	0.2545* (1.96)	0.2491* (1.91)	0.3101** (2.41)
Overpriced	0.6286 (0.63)		
Overpricing		-10.86 (-0.61)	-23.82 -1.45
Underpricing		-7.252 (-1.35)	
R2 (adj)	9.5 %	10.7 %	7.9 %

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

***Table A10** examines the hypothesis suggesting that overpricing determines media coverage in the subscription period (proposed in chapter 6.1.2). All regressions are run on 'NI_{Sub}' as the explained variable.*

In 'Regression 1' the hypothesis is tested by including a dummy ('Overpriced'), which is equal to one if the offering receives a negative first day return, and if otherwise equal to zero. As seen from the regression, this dummy is insignificant. In 'Regression 2' the 'Overpriced' dummy is replaced with variables capturing overpricing and underpricing. These are equal to 'InitRet' if the offering is overpriced or underpriced respectively, if otherwise equal to zero. As seen none of these variables display significant coefficients. Furthermore, 'Overpricing' displays a relatively low coefficient value, indicating economical insignificance. For every percentage overpricing, media coverage increases by only 0.1 articles. In 'Regression 3' 'Underpricing' is removed. As seen, the coefficient value of 'Overpricing' is increased, but still insignificant. Furthermore, the coefficient value is still somewhat low, indicating one article increase per five percentage underpricing. This must be regarded as rather low.

Table A11: Multivariate analysis on underpricing and *'NegativeNews'/'PositiveNews'*

	Regression 1	Regression 2	Regression 3	Regression 4	Regression 6	Regression 7
Constant	-0.0079 (-0.26)	0.0108 (0.36)	0.0180 (0.65)	-0.00201 (-0.07)	0.00005 (0.00)	0.0515*** (3.99)
NegativeNews	-0.0066 (-1.41)	-0.0097** (-2.14)	-0.0093** (-2.09)		-0.0084* (-1.9)	-0.0118** (-2.55)
PositiveNews	-0.0029 (-0.53)	-0.0056 (-1.03)		-0.0041 (-0.74)		
MShare	-0.1111 (-0.74)	-0.11 (-0.71)	-0.1844 (1.29)	-0.0881 (-0.55)		
OverSub	0.0083*** (3.54)	0.0082*** (3.40)	0.0074*** (3.27)	0.008775*** (3.50)	0.0068*** (3.05)	
lnAge	0.0056 (0.68)	0.0053 (0.64)	0.0048 (0.60)	0.002319 (0.28)	0.0037 (0.46)	
Venture	0.0021 (0.10)	0.0035 (0.16)	0.0006 (0.03)	-0.00105 (-0.05)	0.0068 (0.32)	
Book	-0.0567* (1.99)					
Hot	0.0054 (0.23)	0.0060 (0.25)	0.0192 (0.89)	0.02004 (0.87)	0.0161 (0.74)	
R^2 *(adj)*	29.30 %	24.50 %	24.6%	18.4 %	23.6 %	9.6 %

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

*Regressions in **table A11** are run on 'InitRet' as the explained variable. 'Regression 1' includes all of the control variables that are introduced in chapter 3.3.2, except for 'PrRev'. In addition, 'NegativeNews' and 'PositiveNews' are included to test for the hypotheses suggesting an asymmetrical relationship between underpricing and media coverage in the subscription period. Furthermore, in 'Regression 2' 'Book' is excluded due to a suspicion of multicollinearity. As seen, after this removal 'NegativeNews' turns out to be statistical significant. In 'Regression 3', 'NegativeNews' is replaced with 'PositiveNews'. However, 'PositiveNews' does not display any statistical significance. Furthermore, the removal of 'MShare' does not change the statistical significance of 'NegativeNews'. Finally, 'NegativeNews' is statistically significant even in a univariate regression.*

Table A12: Multivariate analysis on *'$NI_{+1\ month}$'* and underpricing

	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
Constant	-12.437 (-1.29)	-11.326 (-1.23)	-12.55 (-1.37)	2.863* (2.10)	6.1187** (7.07)
InitRet	15.383* (1.72)	16.346* (1.95)	16.724* (1.99)	15.863* (1.87)	13.477 (1.41)
MShare	11.211 (1.12)	11.135 (1.19)		14.369 * (1.56)	
lnProc	0.8222 (1.57)	0.7807 (1.56)	0.9129* (1.86)		
Venture	0.60 (0.39)				
B2C	5.86*** (3.48)	5.734*** (3.58)	5.646*** (3.51)	5.958*** (3.68)	
Hot	0.598 (0.38)				
R^2 *(adj)*	20.50 %	24.80 %	24.20 %	22.60 %	1.90 %

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

*Regressions in **table A12** are run on '$NI_{+1\ month}$' as the explained variable. In 'Regression 1' all of the control variables that are described in chapter 3.3.2 and 'InitRet' are included. The results display that 'InitRet' is statistically related to '$NI_{+1\ month}$', even when running regressions including control variables in different combinations (please, notice that all combinations are not presented). Furthermore, the coefficient values of '$NI_{+1month}$' are stable in all regressions. One may also notice that 'B2C' display a statistical relationship on a high significance level. Furthermore, 'lnProc' is statistically significant when removing 'MShare', 'Venture' and 'Hot' (Regression 3). 'MShare' is statistically significant when being replace with 'lnProc'. This may indicate on multicollinearity.*

Table A13: Multivariate analysis on *'NI$_{+2\ months}$'* and underpricing

	Regression 1	Regression 2	Regression 3
Constant	0.95 (0.15)	1.818 (1.71)	2.3817 (2.75)
InitRet	-2.744 (-0.48)	-2.759 (-0.49)	-1.488 (-0.28)
MShare	5.219 (0.82)	5.413 (0.88)	5.551 (0.94)
lnProc	0.0474 (0.14)		
Venture	0.5283 (0.55)	0.5203 (0.54)	
B2C	0.602 (0.56)	0.615 (0.58)	0.483 (0.47)
Hot	0.711 (0.71)	0.7041 (0.71)	
R^2 (adj.)	0.00 %	0.00 %	0.00 %

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

*Regressions in **table A13** are run on NI$_{+2\ months}$. As one can see, none of the regressions, including different combinations of independent variables, display any explanatory power. Furthermore, none of the independent variables display any significance. Examining the coefficients of 'InitRet', one may see that the values are remarkably low. According to the results, one percentage underpricing decreases media coverage by 0.027 articles. This must be regarded as economically insignificant, as well as implausible.*

Table A14: Multivariate analysis excluding outliers I

	Regression 1	Regression 2
Constant	-0.03483 (-1.60)	-0.02425 (-1.12)
NI$_t$	-0.00168 (-0.40)	-0.0049* (-1.74)
MShare	-0.1347* (-1.32)	-0.1007* (-1.00)
OverSub	0.007168*** (4.38)	0.007695*** (4.77)
Venture	0.01156 (0.69)	0.01223 (0.77)
lnAge	0.009999* (1.62)	0.009055* (1.54)
Hot	0.02943* (1.68)	0.02299* (1.32)
Book	-0.03247 (-1.51)	-0.02625 (-1.26)
R^2 (adj)	38.50 %	42.5 %

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

.

Table A14 *presents a multivariate analysis, using a sample excluding possible outliers. Regressions are run on 'InitRet' as the explained variable 'Regression 1' includes '$NI_{-1\ week}$' as an independent variable. In 'Regression 2' this variable is replaced with 'NI_{Sub}'. From the results one may see that 'NI_{Sub}' is still statistically related to 'InitRet' on a 10 % significance level. However, the coefficient value is somewhat reduced, compared to the results presented in table A9. Furthermore, 'Hot', 'lnAge' and 'MShare' display statistical significance to 'InitRet' in this regression. '$NI_{-1\ week}$' is still statistically insignificant.*

Table A15: Multivariate analysis excluding outliers II

	Regression 1	Regression 2
Constant	-6.63	2.164
	(-0.64)	(0.32)
InitRet	24.35	-0.758
	(1.94)	(-0.09)
MShare	11.807	5.312
	(1.18)	(0.81)
lnProc	0.5626	-0.0115
	(1.03)	(-0.03)
Venture	0.268	0.433
	(0.17)	(0.42)
B2C	5.683	0.552
	(3.38)	(0.50)
Hot	-0.279	0.532
	(-0.17)	(0.49)
R^2 *(adj)*	20.50 %	0.00 %

*Numbers in parentheses display the t-statistics. *,** and *** indicate statistical significance at the 10 %, 5 % and 1 % levels respectively.*

Table A15 *presents the results of a multivariate analysis on the relationship between ex post media coverage and underpricing, using a sample excluding possible outliers. 'Regression 1' is run on '$NI_{+1\ month}$' as the explained variable, while 'Regression 2' is run on '$NI_{+2\ months}$'. The results display that 'InitRet' is still statistically significantly related to '$NI_{+1\ month}$'. As seen, however, the coefficient value is remarkably higher compared to the results presented in table A12. Furthermore, one should notice that 'InitRet' is statistically insignificant in 'Regression 2'.*

Appendix 5: Pearson's correlation coefficients

Table A17: Pearson's correlation coefficients

	InitRet	PrRev	MShare	lnProc	OverSub	Hot	Book	lnAge	Venture	B2C	$NI_{-1\ week}$	NI_{Sub}	$NI_{+1\ month}$	$NI_{+2\ months}$	NegativeNews
PrRev	0.426														
MShare	0.033	0.241													
lnProc	-0.037	-0.042	0.217												
OverSub	0.489	0.414	0.265	0.172											
Hot	0.269	0.408	0.181	-0.041	0.315										
Book	-0.283	-0.06	0.049	0.253	0.059	-0.025									
lnAge	0.088	-0.094	0.093	0.098	0.178	0.026	-0.026								
Venture	0.069	-0.149	-0.186	-0.104	0.075	0.106	-0.027	0.108							
B2C	-0.09	-0.152	-0.03	0.085	0.202	-0.205	0.043	0.078	0.016						
$NI_{-1\ week}$	-0.003	0.034	0.049	0.043	0.074	-0.048	-0.173	0.247	0.186	0.23					
NI_{Sub}	-0.253	-0.205	0.163	0.103	0.155	-0.181	-0.239	0.02	0.057	0.258	0.359				
$NI_{+1\ month}$	0.194	0.243	0.184	0.253	0.473	0.043	0.183	0.086	0.027	0.425	0.363	0.385			
$NI_{+2\ months}$	-0.041	-0.14	0.13	0.045	0.232	0.105	-0.146	0.001	0.064	0.066	0.155	0.242	0.49		
NegativeNews	-0.337	-0.565	-0.227	0.050	-0.218	-0.176	0.25	0.060	0.071	0.213	0.168	0.609	0.001	0.065	
PositiveNews	0.045	0.331	0.433	0.162	0.384	-0.024	-0.194	-0.064	-0.043	0.061	0.278	0.572	0.464	0.126	-0.257

Table A17 *displays Pearson's correlation coefficients. The values range from -1 to 1, indicating the degree of the linear relationship between two variables. The value of -1 indicates a perfect negative linear correlation, while the value of 1 indicates a perfect positive linear relationship.*

Correlation between two independent variables may cause multicollinearity, implying type 1 errors or wrong estimates (Brooks, 2002). As seen, none of the variables are strongly correlated. However, there is some correlation between some of the independent variables. Particular interest should be given to 'PrRev', which seems to be relatively correlated with 'OverSub' and 'Hot'. However, one should be aware that this test does not tell anything about the direction of the relationships, nor take any biases into account. Pearson's correlation coefficients should therefore be interpreted with caution. Further testing is therefore needed in order to investigate the possibility of multicollinearity. In this thesis I have conducted this by running regressions including suspicious independent variables in different combinations.

Shaded cells indicate coefficients that deserve attention regarding multicollinearity.

Appendix 6: Hausman test

Step I

Variable	Coef.	Std. Error	t-statistics
Constant	2.982264	4.920712	0.606063
B2C	1.200889	0.845339	1.420600
lnProc	-0.103018	0.275668	-0.373702
InitRet	-7.714559*	4.363224	-1.768087
$NI_{-2\ months}$	0.256231**	0.125069	2.048724
R^2 (adj.)	12.24 %		

Step II

Constant	0.144305***	0.029123	4.955027
NI_{Sub}	-0.054466***	0.007782	-6.998703
MShare	-0.063752	0.098838	-0.645015
OverSub	0.007708***	0.001586	4.861271
Hot	-0.012669	0.015841	-0.799789
Venture	-0.001451	0.014811	-0.097943
Book	-0.028016	0.019579	-1.430922
lnAge	0.004548	0.005498	0.827260
Residual	0.052009 ***	0.008120	6.404956
R^2 (adj.)	64.3 %		

Appendix 6 *displays the results from a Hausman test, which is carried out in order to test for endogeneity between underpricing and media coverage in the subscription period.*

Proceeding: *In step I a regression on NI_{Sub} is run to obtained its fitted values. The residuals are stored, and used as an independent variable in Step II. In Step II a regression on 'InitRet' is run, including the fitted values for NI_{Sub} as a regressor (adjusted by the residuals from Step I). As seen, the residual variable is significant on a 1 % level. Endogeineity is therefore not rejected.*

The procedure is in accordance with the user's manual of the EViews software package.

References

Aggarwal, R. 2003. Allocation of initial public offerings and flipping activity. *Journal of Financial Economics* 68, pp. 111-135

Benveniste, L.M. and Spindt, P.A. 1989. How investment bankers determine the offer price and allocation of new issues. *Journal of financial Economics* 24, pp. 343-361.

Brooks, C. 2002: Introductory econometrics for finance. Cambridge University Press.

Carter, R. B., Dark, F. H., Singh, A. K. 1998 Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPO Stocks. *The Journal of Finance*, 53, pp. 285-311.

Carter, R. B., Manaster, S. 1990. Initial public offerings and underwriter reputation. *Journal of Finance* 45, pp.1045–1067.

Chowdry, B. and Sherman, A. 1996. International differences in oversubscription and underpricing of IPOs. *Journal of Corporate Finance* 2, pp. 359-381.

Clark, G.L.; Thrift, N. and Tickell, A. 2004. Performing finance: the industry, the media and its image. *Review of International Political Economy* 11 (May), pp. 289-310

Cliff, M.T. and Denis, D.J. 2004. Do Initial Public Offering Firms Purchase Analyst Coverage with Underpricing? *The Journal of Finance*, pp. 2871-2901.

Demers, E. and Lewellen, K. 2003. The marketing role of IPOs: evidence from internet stocks. *Journal of Financial Economics* 68, pp. 413-437

Dennien, F. and Kecskès, A. 2007. The Initial Public Offerings of Listed Firms. *The Journal of Finance* 62 (February), pp. 447-479.

DuCharme, L.L. and Rajgopal, S. 2001. Lowballing for "Pop": The Case of Internet IPO Underpricing. Working paper, University of Washington.

Edvardsen, A.B. 2004. Børsprising og –avkastning for norske IKT-selskaper. *SNF-rapport* 16. Samfunns- og Næringslivsforskning AS, Bergen.

Gretland, B. 1994. Børsintroduksjoner. *Praktisk Økonomi & Ledelse* Nr. 3, pp. 31-39.

Habib, M.A. and Ljungqvist, A.P. 2001. Underpricing and Entrepreneurial Wealth Losses in IPOs: Theory and Evidence. *The Review of Financial Studies* 14 (Summer), pp. 433-458

Hanley, W.K. 1993 The underpricing of initial public offerings and partial adjustment phenomenon. *Journal of Financial Economics* 34, pp. 231–250.

Helwege, J. and Liang, N. 2002. Initial Public Offerings in Hot and Cold Markets. Working Paper (September), Ohio State University/Board of Governors of the Federal Reserve System.

Ibbotson, R.G. and Jaffe, J.F. 1975. "Hot issue" Markets. *The Journal of Finance* 30 (September), pp. 1027-1042

Jenkinson, T. and Ljungqvist, A. (2001): Going Public: The Theory and Evidence on How Companies Raise Equity Finance. Second Edition. Oxford University Press.

Keller, G. and Warrack, B. 2003. Statistics for Management and Economics. Sixth edition. International student edition. Brooks/Cole – Thomson Learning.

Liu, L.X.; Sherman, A.E. and Zhang, Y. 2006. Media coverage and IPO underpricing. Working paper, Hong Kong University of Science and Technology/University of Notre Dame.

Ljungqvist, A.P., Nanda, V. And Singh, R. 2001. Hot Markets, Investor Sentiment, and IPO Pricing. CEPR Discussion Paper: 3053.

Ljungqvist, A.P.; Jenkinson, T. and Wilhelm, W.J. Jr. 2003. Global Integration in Primary Equity Markets: The Role of U.S. Banks and U.S. Investors. *The Review of Financial Studies* 16 (Spring), pp. 63-69.

Loughran, T. and Ritter, J.R. 2002. Why Don't Issuers Get Upset about Leaving Money on the Table in IPOs? *The Review of Financial Studies* 15. (December) pp. 413-443.

Megginson, W.L and Weiss, K.A. 1991. Venture Capitalist Certification in Initial Public Offerings. *The Journal of Finance* 46 (July), pp. 879-903..

Ritter, J.R. 2003. Differences between European and American IPO Markets. European Financial Managment 9, pp. 421-434.

Ritter, J.R. and Welch, I. 2002. A review of IPO Activity, pricing and Allocations. *The Journal of Finance* 57 (August), pp. 1795-1828

Rock, K. 1986. Why new issues are underpriced. *Journal of Financial Economics* 15, pp. 187-212.

Samuelsen, A. and Tveter, L.K. 2006. Børsintroduksjoner: Prising av norske børsintroduksjoner med vekt på oljerelaterte selskaper. Master Thesis, Norwegian School of Economics and Business Administration.

Schaller, A. 2004. Marketing Benefits of IPO underpricing. Seminar paper, University of St. Gällen.

Staikouras, C. and Tsatsanis, D. 2004. The impact of media exposure and market psychology on the underpricing of Initial Public Offerings: The UK case. Working paper. Cass Business School, City University, London.

Welch, I. 1989. Seasoned Offerings, Imitation Costs, and the underpricing of Initial Public Offerings. *The Journal of finance* 47 (June), pp. 421-449.

Booth, J.R. and Smith, R. 1986. Capital raising, underwriting and the certification hypothesis. *Journal of Financial Economics* 15, pp. 261-281

Kahneman, D and Tversky, A. 1979. Prospect Theory: An Analysis of Decision under Risk. *Econometrica* 47 (March), pp. 263-292

Internet

A-tekst, www.retriever-info.com/atekst.php

Dagens Næringsliv, www.dn.no

Oslo Stock Exchange, www.ose.no